In The Specification:

Please amend the specification as follows.

Between the title and BACKGROUND OF THE INVENTION please insert the following paragraph:

A2

This is a continuation application of Serial No. 08/964,206 filed November 4, 1997.

Please replace the paragraph beginning at page 1, line 13, with the following rewritten paragraph:

A3

Reading and writing on magnetic memories are performed by the relative sliding of a slider of a magnetic head sliding against a magnetic disc (hard disc). A dynamic pressure (wind pressure) is generated by the relative motion of the sliding surfaces, and forces the slider to separate from the disc surface; however, to obtain high strength signals, it is desired that the separation force be overcome and the distance between the slider and disc surfaces be minimized. In order to satisfy this condition even at low relative speeds without crashing the slider against the disc, the two surfaces may be made planar; however, when such two planar surfaces are brought close together, sticking (adherence) is generated because of the presence of moisture in the ambient air. ,Also, if a lubricant is used to reduce the friction, the phenomenon of sticking becomes even more aggravated. Sticking becomes more severe as the surface roughness (height of protrusions) diminishes, as the humidity increases and as the lubricant thickness increases. Therefore, to satisfy the above requirements in the presence of humidity and lubricant, the surfaces should be sufficiently smooth to minimize the distance between the slider and disc surfaces while sufficiently rough to prevent sticking. To meet such contradictory requirements, it has been a practice to provide micro-protrusions of the order of 10 nanometers (nm) on the sliding surfaces. This will be explained further with reference to Figure 20.

Please replace the paragraph beginning at page 4, line 9, with the following rewritten paragraph:

A4

There has been a serious problem in the actual use of the magnetic discs produced by the techniques described above. It has been found that, during the use of the magnetic disc in sliding contact with the slider of a magnetic head, foreign particles such as debris due to wearing as a result of the sliding action are entrapped between the slider and the disc, and are outstretched so as to stick to the slider or the disc thereby resulting in impeded transmission of signals. Furthermore, because moisture and lubricant may not be distributed uniformly across the surface of the disc, local sticking can occur between the slider and the disc, thereby causing abnormally high friction or, in some cases, self-vibration of the head (referred to as stick-slip), caused by sudden release from sticking, can result in plastic deformation or irregular friction phenomenon.

Please replace the paragraph beginning at page 4, line 23, with the following rewritten paragraph:

A5

The debris biting and sticking phenomenon related to the conventional devices were examined in detail by the present inventors that led to the following observations. The primary causes are that, in the conventional devices, the inclusive angle of contact of the upright surface (side surface) of the micro-protrusions opposing the direction of relative movement of the sliding surface is small, which promotes the formation of a large meniscus. The formation of a meniscus on each of the various shaped of micro-protrusions will be explained in more detail with reference to Figures 23A, 23B and 23C which correspond to meniscus formation on micro-protrusions, $2a_1$, $2b_1$, and $2c_1$, having profiles show in Figures 20, 21 and 22, respectively. In Figures 23A~23C, the slider surface 3 (on a magnetic head for example) is in contact with a liquid substance 4 (moisture in air or lubricant) and the magnetic disc moves in the direction D relative to the slider surface 3. The meniscus means a curved boundary surface having a radius of curvature R formed between the air phase and the liquid phase. The relationship between the radius R and the profile shape of the micro-protrusions will be discussed further with reference to Figure 24.

Please replace the paragraph beginning at page 6, line 18, with the following rewritten paragraph:

A6

When the micro-protrusions produced by the conventional techniques shown in Figures 20~22 were examined, it became apparent that the inclusive angle θ is small (less than 70 degrees) and inevitably, large menisci are formed. In the conventional approach, the effort had been focused on the production aspects of micro-protrusions, and no attention has been paid to the shape of the micro-protrusions or the importance of the meniscus in causing operational problems.

Please replace the paragraph beginning at page 7, line 4, with the following rewritten paragraph:

A7

It is an object of the present invention to resolve the problems inherent in the conventional techniques of producing micro-protrusions by emphasizing the importance of the structure of the micro-protrusions and a process of making optimum structures for micro-protrusions on the sliding surfaces. The approach is to prevent the phenomenon of sticking and reduce entrapping of foreign particles between the sliding surfaces.

Please replace the paragraph beginning at page 7, line 11, with the following rewritten paragraph:

A8

This object has been achieved in a method for making micro-protrusions or micro-cavities on the surface of a substrate comprising the steps of: placing the substrate in a process chamber; supporting a mask member, having a micro shielding surface, independent of and in front of the substrate; and irradiating fast atomic beams onto the surface of the substrate through the mask member. Here, it is preferable that the micro-protrusions or micro-cavities have a height or depth ranging from 10 to 50 nm, and, for use in a slider member, 10 to 1,000,000 protrusions or cavities are formed on a 1mm^2 surface of the substrate.

Please replace the paragraph beginning at page 7, line 22, with the following rewritten paragraph:

A8

The mask member having a micro shielding surface has a very small area of projection for shielding the fast atom beams so as to form micro-sized unetched surfaces in a form of micro-protrusions. The mask member is constructed mechanically or physically independent of the substrate, and thus is separable from the substrate and is not integral with the substrate, as would be a photoresist layer coated on the substrate surface. The mask member is usually held in parallel to the substrate surface.

Please replace the paragraph beginning at page 8, line 5, with the following rewritten paragraph:

A9

The substrate may be a slider member for use in a mechanically sliding portion, that is, at least one of the members relatively movable to the other in a sliding manner. The fast atomic beams are usually irradiated substantially at right angles onto the surface of the substrate.

Please replace the paragraph beginning at page 8, line 10, with the following rewritten paragraph:

A11

The mask member may comprise micro-objects dispersed on the surface of the substrate, e.g. round shaped micro-powders, strings, rods, debris or in any shape. The micro-objects may comprise at least one material selected from the group comprising alumina, carbon, Si_3N_4, SiC, TiN, ZrO_2, MgO, and synthetic resin. Toner particles for use in copying machines are also usable.

Please replace the paragraph beginning at page 8, line 21, with the following rewritten paragraph:

A12

Another aspect of the invention is a method for making micro-protrusions or micro-cavities on a surface of a substrate comprising the steps of: dispersing micro-particles on the substrate surface; and irradiating the substrate surface with fast atomic beams at an angle of incidence determinable by an inclined angle measured with respect to a rotation axis normal to the substrate surface while a

Cont A12

beam source relatively swivels about the rotation axis. The inclined angle with respect to the rotation axis is more than 0 degree and can be selected in a range from 0 to 90 degrees. Usually the beam source is driven to swivel about the rotation axis, however, the substrate can be driven to rotate about the beam axis to obtain the same effect.

Please replace the paragraph beginning at page 9, line 8, with the following rewritten paragraph:

A13

Another aspect of the invention is a method for making micro-protrusions or micro-cavities on a surface of a substrate comprising the steps of: dispersing micro-particles susceptible to etching by fast atomic beams on the substrate surface; and irradiating the substrate surface with fast atomic beams at an angle of incidence determinable by an inclined angle measured with respect to a rotation axis normal to the substrate surface while a beam source relatively swirls about the rotation axis.

Please replace the paragraph beginning at page 9, line 16, with the following rewritten paragraph:

A14

Another aspect of the invention is a method for making micro-protrusions or micro-cavities on a surface of a substrate comprising the steps of: a first irradiation step irradiating the substrate surface with fast atomic beams through a mask member consisting of parallel wire or rod members disposed in contact with or in proximity to the substrate surface; and a second irradiation step irradiating the substrate surface with fast atomic beams through a mask member consisting of parallel wire or rod members disposed in contact with or in proximity to the substrate surface, the parallel wire or rod members being oriented at right angles or at an oblique angle to those in the first irradiation step.

Please replace the paragraph ~~beginning at page 10, line 12,~~ with the following rewritten paragraph:

According to this aspect of the present invention, because the inclusive angle of contact of the side surfaces (upright surfaces) is selected within a range of angles between 80 to 110 degrees, foreign particles do not become entrapped between the micro-protrusion and the sliding surface, but are simply transported by being abutting against the micro-protrusions. In effect, the depression spaces formed by the protrusions act as pockets for the debris particles. Because of the appropriate choice of the inclusive angle, the size of the meniscus is reduced compared with the meniscus size formed in association with conventional micro-protrusions, and sticking is prevented without changing the usual operating parameters such as protrusion height, volume or lubricant thickness or temperature of operation. In other words, another parameter for preventing sticking has been found to assure more reliable operation. Therefore, by forming the inclusive angle of contact to be between 80 to 110 degrees, a thicker layer of lubricant can be used to reduce wear while prevent sticking. Conversely, the control of the meniscus size, by controlling the inclusive angle of contact, enables the force of separation due to the presence of air pressure between the sliding surfaces and the force of attraction working at the meniscus to be optimally balanced, thereby leading to a possibility of effective adjustment of separation distance of the order of nanometers.

A15

Please replace the paragraph beginning at page 11, line 11, with the following rewritten paragraph:

A16

The friction reduction effect of the protrusion is especially high when the inclusive angle is larger than 90 degree, i.e. when $90 < \theta \leq 110$, because when a wear particle hits the protrusion, it goes down along the upright surface (side surface) so as to not cause generation of large friction. The advantage is particularly prominent when the depression is formed as a lattice configuration. Otherwise, a large friction is generated to cause damage to the slider member, fluctuation of the attitude of the slider member, distortion of the support mechanism for the slider member, or deterioration of the sliding surface, which may, at the worst, make the slider unusable.

Please replace the paragraph beginning at page 13, line 24, with the following rewritten paragraph:

A17

Figure 19 is a perspective view of the product made in an eighth embodiment of the method for making the micro-protrusions.

Please replace the paragraph beginning at page 15, line 9, with the following rewritten paragraph:

A18

Figure 2 is a cross sectional view to illustrate the relationship between the protrusion 12a and a sliding surface 3 of the slider, a liquid substance 4, a foreign particle 5 and the direction of motion D. The notations are the same as those shown in Figure 24. As can be seen in this drawing, because the inclusive angle of contact of the upright surface $12a_1$ of the protrusion 12a is 90 degrees with respect to the sliding surface 3, the meniscus formation is less and sticking is less prevalent than those for the protrusions made by the conventional process. Likewise, the foreign particle 5 is less likely to be included between the sliding surface 3 and the protrusion 12

Please replace the paragraph beginning at page 16, line 18, with the following rewritten paragraph:

A19

At the present time, the most sensitive microprofiling device is an Atomic Force Microscope having a fine-needle sensor which explores between two objects to measure the interatomic forces acting between two objects. However, it is difficult to determine the profile shape even with this instrument. In practice, as will be described in the embodiments to follow, the profile shape can be estimated from the angle of irradiation of the fast neutron particles which are used to produce the protrusions.

Please replace the paragraph beginning at page 17, line 13, with the following rewritten paragraph:

A20

The process of forming the protrusions will be explained in the following. Figures 4A-4D are cross sectional views showing the steps in a first embodiment of making the protrusions. In Figure 4A, the substrate 1 is a glass substrate. As shown in Figure 4A, the top surface 10 of the substrate 1 is polished flat. Next, as shown in Figure 4B, fine powdery particles 13 (for example, resin particles which would not be etched by fast neutron particles) of 1 mm diameter as a mask or masking are dispersed on the top surface 10 which is irradiated with a fast neutron beam comprised of SF_6 for one minute. The fast neutron beam is referred to as a Fast Atomic Beam (FAB) and is characterized by its high speed, electrical neutrality and linearity of beam propagation. Because the beam comprises neutron particles, not ionic particles, the FAB is able to etch electrically insulating substances. The FAB has an excellent linear propagation property, and irradiation through a masking at right angles to a target surface will produce upright structures at 90 degrees.

Please replace the paragraph beginning at page 18, line 5, with the following rewritten paragraph:

A21

The powder particles 13 are dispersed so that the FAB will etch 95% of the planar area of the top surface 10, to produce the protrusions 12a, 12b which have the same profile as those shown in Figure 1. Next, the powder particles 13 are washed away, and a magnetic film layer 15 and a carbon film layer 16, functioning as a protective film having lubricating as well as anti-oxidation qualities, are deposited on the surfaces to follow the contours of the protrusions 12a, 12b. These steps complete the process of making a magnetic disc. The upright surfaces of the protrusions 12a, 12b are at 90 degrees to the direction D of the sliding motion of substrate 1, and the carbon film layer 16 follows the contours of the protrusion at the same angle. The upright surfaces of the protrusions produced by the techniques presented in the second to fourth embodiments are formed in the same manner. The formation of a 90-degree angle on the upright surfaces has been made possible for the first time, only through the use of the fast neutron beam, and it should be noted that conventional

techniques are not capable of producing such angels. Although the embodiment was illustrated with the use of powder particles 13 as a masking material, other materials such as fine pieces of needle fibers or plates, ionic crystals such as salt can also be used.

Please replace the Paragraph beginning at page 19, line 2, with the following rewritten paragraph:

Figures 5A-5C are cross sectional views to illustrate a process of producing protrusions in a second embodiment. Those parts which are the same or equivalent to those shown in Figures 4A-4D are given the same reference numerals, and their explanations are omitted. As shown in Figure 5A, a magnetic film 15 and a protective film layer 16 (carbon, in this case) are deposited on top of the substrate 1. Next, a masking device comprised by wires 14 such as fine piano wires arranged in a plane, is positioned near the carbon film layer 16, and an oxygen FAB is radiated from above. The resulting structure, shown in Figure 5C, comprises protrusions $16a_1$-$16a_4$ directly on top of the carbon film layer 16. In this example, wires 14 are separated from the carbon film layer 16, but it is permissible to have the wires 14 contact the carbon film layer 16. Also, it is not necessary to have wires 14 of circular cross sectional shape, and other shapes such as square, oval, trapezoidal and other shapes are permissible.

Please replace the paragraph beginning at page 19, line 19, with the following rewritten paragraph:

Figures 6A-6C are cross sectional views showing a process of making protrusions in a third embodiment. In Figure 6A, a magnetic head 20 (made of a ceramic material) has a slider 21 having a smooth curved sliding surface 21a for sliding on a magnetic disc (not shown). The curved surface is known as a crown, and has a height of 25 nm, for example. The examples shown in Figures 4A-4D and 5A-5C referred to making protrusions on magnetic discs, but in this embodiment, the protrusions are provided on the slider. First, as shown in Figure 6B, the magnetic head 20 and the slider 21 are inverted, and a masking, comprising parallel wires 23, is disposed to face the curved surface 21a, and the FAB is irradiated from above. The resulting structure of the curved surface 20a of a slider 21b

Cont A23

comprising protrusions $21b_1$, $21b_2$, $21b_3$... is shown in Figure 6C. It should be noted that, as in the second embodiment, the wires 23 may be placed in contact with the curved surface 21a, and, there is no need to restrict the cross sectional shape of the wires 23 to a circular shape, and other shapes such as square, oval and trapezoidal are permissible.

Please replace the paragraph beginning at page 20, line 13, with the following rewritten paragraph:

A24

In the second and third embodiments, parallel wires 14, 23 were used for the masking device, but rod members may replace wire members. An example is shown in Figure 7 which is a perspective view of an assembly of rod members. Here, the masking device is comprised by a rod assembly 14A (23A) comprised by rod members $14A_2$ arranged in parallel on a base section $14A_1$. These rod members $14A_2$ may be replaced with wire members, as in the second and third embodiments, without affecting the result. The cross sectional shape of the rod members $14A_2$ shown in Figure 7 is square, but other shapes such as circular, oval and trapezoidal are also permissible. The wire assembly 14A (23A) shown in this drawing can be made by a process which will be presented later in Figure 13 or 14.

Please replace the paragraph beginning at page 21, line 1, with the following rewritten paragraph:

A25

Figures 8A-8C show process steps related to making protrusions in a fourth embodiment, and Figure 8D is a perspective view of the product produced by the process. In this embodiment, protrusions are produced on top of the carbon film layer 26 serving as the protective layer for contacting the slider of the magnetic head. In contrast to the previous protrusions which were isolated entities, the protrusions produced in this example are formed in a contiguous way. As shown in Figure 8A, the magnetic head is comprised by carbon film layer 26 and an underlying whole slider structure referred by numeral 25. Figure 8B is a perspective view of a wire matrix 28 used as a masking for the FAB irradiation process. The matrix masking 28 is placed in the vicinity of the carbon film layer 26, and an oxygen FAB is radiated for fifteen seconds through the matrix masking

28. The resulting product is shown in Figure 8D comprising a contiguous carbon protrusion 26a formed from carbon film layer 26. The matrix masking 28 is disposed in such a way that the direction D of the relative sliding motion is aligned with the diagonals of square-shaped depressions formed in layer 26. It should be noted again that there is no restriction in the cross sectional shape of the wires 28, and other shapes such as squares, oval, trapezoidal and other shapes may be substituted. The matrix masking 28 also need not necessarily be made into a net shape beforehand. It is permissible to utilize a set of parallel wires and another set of parallel wires disposed at right angles to the first set to form a net shape.

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A25

Please replace the paragraph beginning at page 22, line 2, with the following rewritten paragraph:

A26

The example illustrated in Figure 8D utilized a net type masking 28, but a matrix type masking may be made by using materials other than wires. Figures 9-12 show examples of other types of contiguous masking, referred to generally as matrix-type masking hereinbelow, which includes plate-type masking having fine holes which are equivalent in their performance for making protrusions. Figure 9 shows a matrix type masking 28A having a plurality of square-shaped cavities formed in a plate, Figure 10 shows a masking 28B having a plurality of hexagonal-shaped cavities, or honeycomb shaped cavities, formed in a plate, Figure 11 shows a masking 28C having a plurality of circular-shaped cavities formed in a plate, and Figure 12 shows a masking 28D having a plurality of rhombus-shaped cavities formed in a plate. Other shapes of cavities may also be adopted.

Please replace the paragraph beginning at page 22, line 17, with the following rewritten paragraph:

A27

A method for making the matrix type masking shown in Figure 9-12 will be briefly explained with reference to Figures 13A-13C and 14A-14F. Figures 13A-13C, for example, relate to the steps for making the masking 28A shown in Figure 9. A base plate S is covered with a photoresist film R (Figure 13A); next, square shaped portions are removed for the photoresist film R by means of a

Cont A27

photolithographic process (Figure 13B); cavities are formed in the base plate S corresponding to the locations of the removed sections of film R (Figure 13C) by an etching process to produce the matrix type masking 28A shown in Figure 9.

Please replace the paragraph beginning at page 23, line 2, with the following rewritten paragraph:

A28

Figures 14A-14F, for example, relate to the steps for making the masking 28B shown in Figure 10. The masking process utilizes a base plate S, an electrically conductive layer E and a photoresist layer R. The conductive layer E is formed on the base plate S (Figure 14A), and the layer E is covered with the photoresist film R (Figure 14B). Next, hexagonal shaped portions are removed from the photoresist film R by means of a photolithography process (Figure 14C); cavities are formed in the conductive layer E corresponding to locations of removed sections of film R by an etching process, and the remaining resist film R is removed (figure 14D). Using the remaining conductive layer E, a thick electroplated layer M is produced on the layer E (Figure 14E). Next, the conductive layer E is removed by immersing the entire masking-precursor in an etching solution which does not attack the base plate S and the plated layer M, the latter being separated form the base plate S to produce matrix type masking 28B shown in Figure 10. It is clear that the rod assembly 14A (23A) shown in Figure 7 can also be produced by the steps outlined in Figures 13A-13C or 14A-14F.

Please replace the paragraph beginning at page 23, line 21, with the following rewritten paragraph:

Figures 15A-15C are cross sectional views of the steps in making protrusions in the fifth embodiment. In contrast to each of the foregoing embodiments related to making protrusions having upright surface angles of 90 degrees, the fifth embodiment relates to making protrusions having upright surface angles exceeding 90 degrees, whose profile is the same as that shown in Figure 3B. Figure 15A shows substrate 1 for the magnetic disc including a magnetic film layer 15 and a carbon film layer 16. Powder particles 13 (for masking) such as those shown in Figure 15B are dispersed on the surface of the magnetic disc, and the surface is irradiated with the FAB from above. A beam

Cont Sub A29

source 20 for the FAB is inclined at a specific angle with respect to an axis 19 which is at right angles to the surface of the magnetic disc. The FAB is emitted from the beam source 20 to the carbon film layer 16 while the source 20 is made to relatively swivel about the axis 19. In Figure 15B, the incident beams emitted when the beam source 20 is located at the double-dotted broken line are shown by solid lines while the incident beams emitted when the beam source 20 is located at the opposite location are shown by ordinary broken lines. By utilizing this method, protrusions $16b_1$ having upright ~~surface angles in~~ excess of 90 degrees are formed on the sliding surface.

Please replace the paragraph beginning at page 24, line 18, with the following rewritten paragraph:

A30

Figures 16A-16D are cross sectional views, in a sixth embodiment, of the steps for making protrusions on a magnetic disc having a carbon film layer 16 with the use of powder particles 30 made of carbon, for example. As shown in Figure 16A, the carbon particles 30 are dispersed on the carbon film layer 16, and the FAB is radiated form above. After a certain period of irradiation, protrusions $16a_1$ shown in Figure 16B are formed on the carbon film layer 16, however, because the FAB is also directed at the powder particles 30, their diameters are reduced during the irradiation process. An example of the reduced-diameter powder particle $30a_1$ is shown in Figure 16B. When the irradiation process is continued in this state, because the masking particle now has a reduced diameter, a protrusion $16a_2$ having a smaller diameter than the original powder particle 30 is formed on top of the prior protrusion $16a_1$, as illustrated in Figure 16C. The powder particle becomes further reduced to produce a powder particle $30a_2$, as shown in Figure 16C. If the irradiation time and/or the irradiation strength are adjusted so as to produce powder particles of gradually reducing diameters, the protrusion assumes substantially a cone shape as illustrated in Figure 16D, and the original powder particle 30 becomes a micro-particle $30a_n$, and ultimately disappears as the irradiation process is continued. The process finally produces protrusions having an upright surfaces oriented at angles less than 90 degrees with respect to the sliding surface. An advantage of this process is that the cumbersome step of washing off the powder particles necessary in the example shown in Figure 4A-

4D can be eliminated. It can be readily understood that the use of the above process simultaneously with the method of slanted irradiation FAB shown in Figures 15A-15C will enable production of an inclusive angle of the upright surface at 90 degrees with respect to the sliding surface.

Please replace the paragraph beginning at page 26, line 1, with the following rewritten paragraph:

A31

The foregoing embodiments are related to methods of forming protrusions on a magnetic disc or slider surface. It should be noted that the formation of such protrusions is not limited to magnetic discs or sliders, and they can be produced equally well on other devices such as optical magnetic discs and their associated parts. An example of application to a radial slide bearing is illustrated in Figures 17A-17D, and an example of an application to a thrust bearing is shown in Figure 18.

Please replace the paragraph beginning at page 26, line 9, with the following rewritten paragraph:

Figures 17A-17D are cross sectional views of the steps of making protrusions in a seventh embodiment. A radial slide bearing housing comprises a steel block 33 having an axial hole 34 through the middle thereof for insertion of a rotation shaft (not shown). As shown in Figure 17A, the block 33 constitutes a housing for the bearing, and the inside surface of the axial hole serves as the bearing surface. Next, as shown in Figure 17B, parallel wires 36 are arranged to face the inner surface of the block 33, and a beam source 38 shown in Figure 17C is inserted into the axial hole 34 so as to irradiate the inner surface of the axial hole 34 with the FAB. This FAB irradiation process is carried out while rotating the beam source 38 about its axis 38a as well as translating the beam source 38 in the axial direction. This process results in the production of protrusions 39, on the inner surface of the axial hole 34, having upright surfaces at 90 degrees to the sliding surface, as shown in Figure 17D.

Please replace the paragraph beginning at page 27, line 1, with the following rewritten paragraph:

A33

Figure 18 is a perspective view of a step in making the protrusions in an eight embodiment. A plurality of wires 44 are arranged radially on a thrust bearing housing 43, made of steel, having a sliding surface 43a, and the FAB is irradiated from above. This process results in the production of protrusions on the sliding surface 43a, but the process of formation is similar to the cases presented earlier and will not be illustrated.

Please replace the paragraph beginning at page 27, line 17, with the following rewritten paragraph:

A34

Figure 19 shows a case of forming two-stage protrusions on a carbon film layer 26. In Figure 19, protrusions 26b are comprised of a plurality of top-stage protrusions $26b_1$ and lower-stage protrusions $26b_2$. The protrusion 26a which was shown in Figure 8D was made by using a matrix type masking comprising a wire-net 28. The protrusions 26b shown in Figure 19 are made by arranging wires of the net aligned in one direction as a first masking. And after irradiating with the FAB, the wires are then arranged in the orthogonal direction to be used as a second masking, to finally produce two-stage protrusions. The protrusions 26b shown in Figure 19 were made by this two-step process. That is, wires aligned in the Y-direction were used first to irradiate with the FAB, and after removing these U-wires, another set of wires aligned in the X-direction were used for further irradiation.

Please replace the paragraph beginning at page 28, line 7, with the following rewritten paragraph:

A35

Such two-stage protrusions 26b not in contact with each other through the sliding surface can be produced by using the above method, without relying on the powder process illustrated in Figures 4A-4D, thereby simplifying the process. The two-stage protrusions can also be made by using a